

**ALARM DEVICE FOR PICKPROOFING A LOCK MEMBER****BACKGROUND OF THE INVENTION****1. Field of the Invention**

5 The invention relates to an alarm device, more particularly to an alarm device adapted for pickproofing a lock member.

**2. Description of the Related Art**

10 Various types of conventional locks are available to meet different requirements. For instance, a lock with a keyhole is designed for operation using a key, whereas a lock with a keypad is designed for operation by keying in a correct password. For added convenience, some locks employ more than one control mechanism. For example, vehicles, such as cars, motorcycles, etc., are  
15 generally equipped with a lock that can be manually operated with the use of a key, and that can be remotely operated with the use of a remote controller. In addition, the locks on doors of some premises can be controlled using either a key or electronic sensing equipment. Locks  
20 that can be operated through remote control or through electronic sensing equipment are also equipped with a key-operated mechanism so as to permit manual locking and unlocking operations in the event of failure of the remote controlled mechanism or electronic sensing  
25 mechanism.

Conventional key-operated lock mechanisms are disadvantageous in that a keyhole in the same is designed

to be easily accessible and is thus susceptible to being picked by thieves. There is thus a need to enhance security of electronic locks that incorporate key-operated mechanisms.

5     **SUMMARY OF THE INVENTION**

Therefore, the object of the present invention is to provide an alarm device for a lock member so as to overcome the aforesaid drawbacks associated with the prior art.

10     Accordingly, the alarm device of this invention is adapted for pickproofing a lock member that has one end formed with a keyhole. The alarm device comprises a mounting member, an alarm actuator, and an alarm generator. The mounting member includes a base plate  
15     formed with a through hole, and is adapted to be disposed adjacent to the lock member such that the through hole in the base plate is registered with the keyhole in the lock member. The mounting member is further formed with a containing space that opens toward the lock member.  
20     The alarm actuator is mounted removably in the through hole in the base plate. The alarm generator includes an alarm circuit disposed in the containing space, and a contact member connected electrically to the alarm circuit and disposed to contact the alarm actuator when  
25     the alarm actuator is mounted in the through hole in the base plate. The alarm circuit is operable in a selected one of an armed mode, where the alarm circuit

generates an alarm output in response to detection by the contact member of removal of the alarm actuator from the through hole in the base plate, and a disarmed mode, where the alarm circuit is inhibited from generating the alarm output when the contact member detects the removal of the alarm actuator from the through hole in the base plate.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiment with reference to the accompanying drawings, of which:

Figure 1 is a partly exploded, perspective view of the preferred embodiment of an alarm device for a lock member according to the present invention;

Figure 2 is a partly exploded, schematic sectional view of the preferred embodiment;

Figure 3 is an exploded perspective view to illustrate an alarm actuator of the preferred embodiment;

Figure 4 is a partly exploded, partly sectional view of the alarm actuator of Figure 3;

Figure 5 is a partly sectional, schematic view to illustrate how the preferred embodiment can be used to deny access to a keyhole in a lock member;

Figure 6 is a partly sectional view to illustrate an engaging position of retaining members of the alarm actuator;

Figure 7 is a partly exploded, partly sectional view to illustrate how the alarm actuator is removed from a mounting member; and

Figure 8 is a view similar to Figure 6, but illustrating a disengaging position of the retaining members of the alarm actuator.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

Referring to Figures 1 and 2, the preferred embodiment of an alarm device according to the present invention is shown to be adapted for pickproofing a conventional lock member 2 that has one end formed with a keyhole 21 and that is mounted on a door panel 10. The alarm device comprises a mounting member 1, an alarm actuator 4, and an alarm generator 3.

The mounting member 1 is to be mounted fixedly on the door panel 10, and includes a base plate 11 and a peripheral wall 12 that extends transversely from a periphery of the base plate 11 toward the door panel 10. The base plate 11 is formed with a through hole 112. The mounting member 1 is adapted to be disposed adjacent to the lock member 2 such that the through hole 112 in the base plate 11 is registered with the keyhole 21 in the lock member 2. The base plate 11 and the peripheral wall 12 cooperate to form the mounting member 1 with a containing space 13 that opens toward the lock member 2. In this embodiment, the base plate 11 is formed with a mounting tube 111 that defines the through hole 112

and that extends in a direction away from the lock member 2. The mounting tube 111 is formed with a radial inward flange 113 that extends into the through hole 112. The radial inward flange 113 has opposite outer and inner flange surfaces to be disposed distal from and proximate to the lock member 2, respectively.

Referring to Figures 2, 3 and 4, the alarm actuator 4 is mounted removably in the through hole 112 in the base plate 11, and includes a base seat 41, a pair of magnets 42, a pair of retaining members 43, a pair of biasing members 44, a rotary member 45, an inner cap 46, an outer cap 47, and a release key 5. In this embodiment, the alarm actuator 4 is inserted removably into the mounting tube 111, and engages removably the radial inward flange 113 in the mounting tube 111.

The base seat 41 has a face plate 411 and a retaining wall 412. The face plate 411 has a rim 416 that is disposed to abut against the outer flange surface of the radial inward flange 113 when the base seat 41 is inserted into the mounting tube 111, as best shown in Figure 5. The retaining wall 412 extends from the face plate 411. The retaining wall 412 extends through the radial inward flange 113 and into the through hole 112 when the base seat 41 is inserted into the mounting tube 111, as best shown in Figure 5. The retaining wall 412 confines a receiving space 413 that opens in a direction away from the face plate 411. The face plate 411 is further formed

with an insert hole 414 therethrough, and has a pair of magnet recesses 415 for retaining the magnets 42 therein. The retaining wall 412 is formed with a pair of mounting holes 418, and a pair of diametrically opposite radial retaining holes 417 that are in spatial communication with the receiving space 413. The retaining wall 412 is further formed with two pairs of stop blocks 419 that project into the receiving space 413. The stop blocks 419 in each pair are disposed on two sides of a corresponding retaining hole 417. Each of the radial retaining holes 417 has a restricted opening 410 proximate to the receiving space 413.

Each of the retaining members 43 is received in a corresponding one of the retaining holes 417, and has opposite first and second end portions 433, 431. The first end portion 433 has an engaging surface 434 that is disposed proximate to the inner flange surface of the radial inward flange 113 when the base seat 41 is inserted into the mounting tube 111, and a curved surface 435 that is opposite to the engaging surface 434, and that abuts against the radial inward flange 113 and that permits movement of the retaining member 43 to a disengaging position when the retaining wall 412 is extended through the radial inward flange 113 during insertion of the base seat 41 into the mounting tube 111.

Each retaining member 43 is movable between an engaging position, where the engaging surface 434 of the first end portion 433 of the retaining member 43 abuts against the inner flange surface of the radial inward flange 113 such that the retaining member 43 and the face plate 411 cooperate to retain the base seat 41 in the mounting tube 111, as shown in Figures 5 and 6, and the disengaging position, where the retaining member 43 is retracted into the corresponding retaining hole 417 such that the first end portion 433 of the retaining member 43 disengages from the inner flange surface of the radial inward flange 113 so as to permit removal of the base seat 41 from the mounting tube 111, as shown in Figures 7 and 8. Each of the biasing members 44 serves to bias a corresponding one of the retaining members 43 to the engaging position.

The rotary member 45 is disposed rotatably in the receiving space 413, and is formed with a slot 455 to engage removably the release key 5. The rotary member 45 is coupled to the second end portions 431 of the retaining members 43 such that rotation of the rotary member 45 results in movement of the retaining members 43 between the engaging and disengaging positions.

The release key 5 includes an enlarged handle portion 51, a connecting stem 52 extending from the handle portion 51, and a control portion 53 connected to a distal end of the connecting stem 52. The release key 5 is to

be inserted into the insert hole 414 in the face plate 411 of the base seat 41, engages removably the slot 455 in the rotary member 45, and is operable so as to drive rotation of the rotary member 45 relative to the base seat 41.

In this embodiment, the second end portions 431 of the retaining members 43 extend into the receiving space 413, and are disposed between the face plate 411 and the rotary member 45. The rotary member 45 includes a circular body 451 formed with a pair of cam surfaces 453 that act upon the second end portions 431 of the retaining members 43 such that rotation of the rotary member 45 due to operation of the release key 5 results in movement of the retaining members 43 between the engaging and disengaging positions. The circular body 451 is further formed with a pair of curved limit plates 452 that cooperate with the stop blocks 419 in the receiving space 413 to limit extent of angular rotation of the rotary member 45 relative to the base seat 41. Preferably, the slot 455 in the rotary member 45 is confined by a pair of slot-confining walls 454, which project from the circular body 451.

Each cam surface 453 of the rotary member 45 defines a corresponding cam hole, and includes a linear section 456 proximate to the center of the circular body 451 and having first and second end points, the first end point being disposed farther from the center of the



circular body 451 than the second end point, a curved section 457 that extends counterclockwise from the first end point, and an inclined section 458 that extends from the second end point and that is connected to the curved section 457. The second end portion 431 of each retaining member 43 is formed with a cam post 432 that extends into the cam hole defined by the corresponding cam surface 453 and that abuts against the cam surface 453.

The inner cap 46 is formed with a pair of posts 461 that engage the mounting holes 418 in the retaining wall 412 so as to mount the inner cap 46 on the retaining wall 412, thereby closing the receiving space 413 and thereby retaining rotatably the rotary member 45 in the receiving space 413.

The outer cap 47 is mounted detachably on the base seat 41 to cover the insert hole 414. In this embodiment, the outer cap 47 is made of a magnetically attractive material, and is attracted to the base seat 41 by means of the magnets 42 disposed in the magnet recesses 415.

Referring once again to Figures 1 and 2, the alarm generator 3 includes an alarm circuit 31 disposed in the containing space 13, and a first contact member 32 connected electrically to the alarm circuit 31 and disposed to contact the alarm actuator 4 when the alarm actuator 4 is mounted in the through hole 112 in the base plate 11. The first contact member 32 is to be disposed between the base plate 11 and the lock member

2. The alarm generator 3 further includes a second contact member 33 connected electrically to the alarm circuit 31 and to be disposed closer to the lock member 2 than the first contact member 32. In this embodiment, the base plate 11 is further formed with a first post unit 114 that extends into the containing space 13 for mounting the first contact member 32 thereon, and a second post unit 115 that extends into the containing space 13 and that is longer than the first post unit 114 for mounting the second contact member 33 thereon.

Referring to Figures 3, 5 and 6, when the retaining members 43 are in the engaging position and retain the alarm actuator 4 in the through hole 112 in the mounting member 1, the cam posts 432 abut against the curved sections 457 of the cam surfaces 453 such that the engaging surfaces 434 of the retaining members 43 abut against the inner flange surface of the radial inward flange 113. In addition, the inner cap 46 extends into the containing space 13 and abuts against the first contact member 32, and the outer cap 47 is attached to the base seat 41 to cover the insert hole 414. The alarm circuit 31 can be operated in an armed mode (such as with the use of a remote controller) at this time.

When the alarm actuator 4 is mounted in the through hole 112 in the mounting member 1, access to the keyhole 21 in the lock member 2 is not possible. When operated in the armed mode, the alarm circuit 31 generates an

alarm output in response to detection by the first contact member 32 of removal of the alarm actuator 4 from the through hole 112 in the mounting member 1, thereby discouraging picking of the lock member 2.

5        Referring to Figure 3, 7 and 8, when it is desired to operate the lock member 2, it is necessary to first operate the alarm circuit 31 in a disarmed mode (such as with the use of the aforesaid remote controller). During operation in the disarmed mode, the alarm circuit  
10       31 is inhibited from generating the alarm output when the first contact member 32 detects the removal of the alarm actuator 4 from the through hole 112 in the mounting member 1. While the alarm circuit 31 operates in the disarmed mode, the alarm actuator 4 can be removed from  
15       the mounting member 1 in the following manner: First, the outer cap 47 is detached from the base seat 41 to expose the insert hole 414. Then, the release key 5 is inserted into the insert hole 414 in the face plate 411 of the base seat 41, and engages the slot 455 in the  
20       rotary member 45. As the rotary member 45 rotates due to operation of the release key 5, the inclined sections 458 of the cam surfaces 453 will come into contact with the cam posts 432, thereby pulling the retaining members 43 to the disengaging position against biasing action  
25       of the biasing members 44. When the retaining members 43 are in the disengaging position, the alarm actuator 4 can be removed from the mounting member 1 with the

use of the release key 5 so as to expose the keyhole 21 in the lock member 2. Thereafter, another key (not shown) can be inserted into the keyhole 21 through the through hole 112 in the mounting member 1 for operating the lock member 2.

To mount the alarm actuator 4 in the through hole 112, it is only required to push the former into the latter. As the retaining members 43 move into the through hole 112, the curved surfaces 435 thereof initially abut against the radial inward flange 113, thereby moving the retaining members 43 to the disengaging position. Subsequently, after the curved surfaces 435 have moved past the radial inward flange 113, the retaining members 43 are restored to the engaging position by virtue of the biasing members 44.

The alarm device of this invention is applicable to a battery-operated electric lock with a key-operated mechanism. While the electric lock has a relatively large electrical power requirement for driving locking and unlocking operations thereof, the electrical power required to arm and disarm the alarm circuit 31 is relatively small. Hence, while the residual power of a battery source may be inadequate for electrical operation of the electric lock, it is still sufficient to permit disarming of the alarm circuit 31.

As mentioned hereinabove, when operated in the armed mode, the alarm circuit 31 generates an alarm output

in response to detection by the first contact member 32 of removal of the alarm actuator 4 from the through hole 112 in the mounting member 1, thereby discouraging picking of the lock member 2. On the other hand, if a burglar tries to break the alarm device of this invention, the alarm actuator 4 will be displaced toward the second contact member 33. Hence, during operation in the armed mode, the alarm circuit 31 further generates the alarm output when the second contact member 33 contacts the alarm actuator 4, thereby discouraging breaking of the alarm device of this invention.

While the present invention has been described in connection with what is considered the most practical and preferred embodiment, it is understood that this invention is not limited to the disclosed embodiment but is intended to cover various arrangements included within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.